Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

• After two meetings of the work group, members requested a summary of existing data. This summary was prepared by EPA, UDEQ, Park City, and the Summit County Health Department.

• We prepared a Background and Chronology to trace the history of how we got here.

• We broke existing data down into three categories:

(1) **Physical information** about the tailings and contamination, generally covering pre-Ordinance conditions - is the stuff there and is it toxic?
(2) **Health or exposure data** - was it/is it causing health problems?
(3) Information about the **implementation of the Ordinance** - has any problem been remedied?

• For each of these categories, we attempted to answer the following questions:

– What kinds of information are we talking about?
– What can this information tell us?
– What information do we have?

A. BACKGROUND AND CHRONOLOGY

1900-1930	700,000 tons of tailings deposited in Prospector area
1940s	Pacific Bridge Co. reworks tailings (acid leached)
1970s	Residential and commercial development commences in Prospector neighborhood
1983	Tests indicate elevated levels of heavy metals in Prospector soils
1985	Prospector SID adopted EPA proposes Prospector as Superfund site Park City Submits comments and rescores site below threshold for action

Special Improvement District

- Public Process: All affected property owners notified
- Property owners petitioned City to establish district
- Numerous public hearings and media coverage
- Location (See Prospector map)
- Ordinance was result of hearings and consultations with EPA and State Health Department
- Cost $1.36 Million
- Effectiveness

  100% of vacant properties in Soils District capped by 1987

  EPA Concurrence: Duprey letters 1988, 1989

A. BACKGROUND AND CHRONOLOGY

1986	SARA: Silver Creek Tailings exempted from Superfund list
1987	Three party testing agreement approved
1988	Prospector Landscaping Ordinance adopted
1992	Park City sues property owners to achieve compliance
	Superfund Ammendment: No Lender Liability
1993-Present	Ongoing enforcement and administration of Ordinance
	Periodic updates on progress to EPA and UDEQ
1994	Ordinance boundaries expanded. Name changed to Park City Landscaping and maintenance of Soil Cover Ordinance

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(1) Physical Information

What kinds of information are we talking about?

- Concentrations of heavy metals in the tailings or soil (such as parts of lead per million parts of material).
- Concentrations of heavy metals in the dust of the home
- Leachability or solubility of the metals in the tailings or soil (do they dissolve in water or acid)?
- Bioavailability of heavy metals in the soil (will they be absorped by the body?)
- Species (types) of heavy metals or minerals in the tailings or soil (what form of lead do we have?)

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(1) Physical Information

What can this information tell us?

• Concentrations of heavy metals (e.g. lead) can be compared to typical lead cleanup levels to see if a potential problem exists. One can sample across entire areas to see if there is a general problem, or at specific residential yards to see if that yard is a problem. The upper layers of soil are the most critical because that is what we are exposed to most frequently. However, contamination below the surface can also cause problems intermittently and over time (through gardening, soils mixing over time, etc)
• Indoor dust is a good indicator to see if soil contamination is finding its way into a home. Dust levels are important because children often contact dust on floors, pets, toys, etc. Both soil and dust concentrations tell us if metals are present for people to be exposed to, but alone cannot say if the exposure is actually occurring or what effects it is causing.
• Material that dissolves well into water or acid is generally worse from an environmental standpoint than material that doesn't. For heavy metals (e.g. lead) to cause problems, the body must be able to dissolve and absorb them. Solubility or leachability is often used (sometimes incorrectly) as an *estimate* for bioavailability - what fraction of material can be absorbed by a human body.
• Actually *measuring* the bioavailablity of a heavy metal takes solubility a step further - tests are done to try to quantify what fraction of the metal (e.g. lead) will be absorbed by a human body. EPA has done some tests on pigs to estimate bioavailability of material at other sites. The more bioavailable the material, the less material you need to cause a problem.
• Finding what species of metal (e.g. lead) is present can help estimate bioavailability. Certain types of lead are more soluble and bioavailable. There are often many types of lead present at the same site.

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(1) Physical Information

What information do we have?

• We have a good deal of information on general concentrations of metals in the tailings and soils *below* the soil cap in the Prospector area, but little on a yard by yard basis. *Soil* sampling in 1983 (prior to capping) showed lead levels in surface soils ranging from 1170 parts per million (ppm) to 4000 ppm (UGMS 1983 in ATSDR 1988). Soil sampling by EPA, UDEQ, and USGS in 1987 (after some capping) indicated a maximum soil level of 2250 ppm to 5840 ppm (ATSDR 1988). Subsurface sampling by the USGS and UDEQ in 1987 showed that tailings were present to depths of many feet in the Prospector area and lead concentrations in *tailings* ranged from 6,700 ppm to 13,000 ppm (UDH 1989). Levels could vary considerably across the area - sampling as part of the Ordinance has shown this to be the case. EPA surface soil cleanup levels for lead generally range from 500 ppm to 1200 ppm. Emergency action is often taken if surface soil concentrations exceed 3000 ppm. The Ordinance was adopted to put a clean soil barrier of six inches over these tailings and contaminated soils.

• A few studies have measured concentrations in indoor dust. A study in 1983 (prior to capping) found indoor dust concentrations which ranged from 307 ppm to 8,267 ppm with an average indoor dust concentration of 1732 ppm (UGMS 1983 in ATSDR 1988). For indoor dust, these values are very high and indicate that lead was making its way into some homes at generally unacceptable levels prior to capping. The 1988 ATSDR blood lead study also measured indoor dust after significant capping. Lead concentrations ranged from 37 ppm to 240 ppm. These values are considerably lower than 1983 and seem to indicate that capping significantly reduced lead levels in indoor dust, though other factors may also be responsible (such as heightened awareness and cleaning).

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(1) Physical Information

What information do we have (CONTINUED)?

• We have very little direct information on solubility, bioavailability, and speciation, but do have some anecdotal information. (1) In general, contamination found in mining wastes (e.g. lead) is less bioavailable than pure material (such as lead from car batteries or lead paint). (2) During the Ordinance era, many soil samples have been tested using the Toxicity Characteristic Leaching Procedure (TCLP), which is designed to see how much lead or other metal will leach out of the soil if it was placed in a landfill under very acidic conditions - this is a legal test to determine if the soils can be taken to normal landfill and is not a biological test. These tests generally showed that the material is not very acid leachable relative to other wastes which would generally indicate reduced bioavailablity. However, other mining sites have suggested that TCLP may not be a good estimate of bioavailability. (3) Before the Prospector area was developed, most or all of the tailings were reworked over the years using an acid extraction process - to extract remaining minerals for financial purposes. This likely reduced the bioavailability as well. Overall, we can say that the bioavailabily of the material is probably low relative to some other sites, though it is impossible to quantify with the limited information available.

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(2) Health/Exposure Data

What kinds of information are we talking about?

- One can *estimate* environmental exposures and effects based on physical information alone, but biological tests actually *measure* those exposures and effects directly in the population of interest.

- Of primary interest for these types of sites are blood lead measurements. Blood lead measurements can be done as part of a statistical study (done to try to infer effects on an entire population by measuring only a part of that population) or can be done on an individual basis (done strictly to look for effects in the individual). Children aged 0-7 years and pregnant mothers are the most sensitive population for lead.

- Exposure to other metals can be measured in other ways - generally through urine samples.

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(2) Health/Exposure Data

What can this information tell us?

• Blood lead measurements are the most effective tool we have for measuring lead exposure both in individuals and in groups. Whereas modeling using physical information only *estimates* risk, blood lead measurements actually *measure* it.

• However, there are important limitations to blood lead measurements/studies: (1) It is only a snapshot in time and may not be indicative of past or future exposures. Lead only stays in blood for a period of months, and levels decline over that time after exposure. (2) Blood lead studies are only as good as the study design - it is important to design the study so you get the information you need. It is also crucial that the results are interpreted correctly and that broad generalizations are not made unless the data supports them.

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(2) Health/Exposure Data

What information do we have?

• The 1984 Study. A blood lead study was performed in 1984 as part of a student's thesis. Blood lead data was collected from 39 children (ages 3-12) potentially exposed to tailings in the Prospector area. Blood lead data was also collected from 9 children in Park Meadows for comparison. Samples were collected in both April and October. This study was in response to initial concerns on Prospector and was completed before significant capping of tailings occurred in 1985.

• The 1987 Study. In response to continued interest in the Prospector area, the Agency for Toxic Substances and Disease Registry (part of the Center for Disease Control and a public health partner of Superfund) conducted a blood lead study in 1987. This was after significant covering of tailings in 1985. Blood lead data was collected from 127 people of all ages. For children aged 0-7 years, 38 samples were taken from children living in Prospector and 13 samples were taken from children living in Park Meadows for comparison. Samples were collected only in October.

• Public health information. Laboratories providing blood lead tests to Utah residents are required to report this information to the State Health Department. Cases of elevated blood leads are referred to the County. Information is available from 1996-2000.

• Anecdotal information. Awareness of lead issues in Prospector was generally high during the 1980s and 1990s. Many parents likely received blood lead tests for their children. If high values were found, this information would likely be made public either through the public health system or through other means. We are aware of only a few isolated cases of elevated blood leads.

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(2) Health/Exposure Data

What information do we have (1984 Study Findings)?

• The average blood lead level for children 3-12 years potentially exposed to the Prospector Tailings was higher than the comparison area both in April (9.5 ug/dL vs 7.5 ug/dL) and October (10.5 ug/dL vs. 9.5 ug/dL). This difference was *not* found to be statistically significant, though this was likely due in large part to the small sample size of the comparison group.

• Blood lead levels increased in October relative to April in both areas, indicating a seasonal component to exposure.

• The average blood lead levels were compared to national averages for white children for the period 1976-1980. This average was reported as approximately 15 ug/dL. All of the averages for Park City were lower than the reported national average. However, national blood lead averages were declining rapidly in the 1980s due primarily to the phase out of leaded gas. Because of this, comparing 1984 values with averages from 1976-1980 is not a good comparison.

• All individual levels observed were lower than the CDC guideline at the time of 25 ug/dL. However, the current CDC guideline is 10 ug/dL. Current guidelines call for no greater than a 5% chance that an individual will have have a blood lead greater than 10 ug/dL. Former guidelines were based on the *average* of a population as opposed to a 5% chance. More than 5% of the Prospector children exceeded 10 ug/dL.

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(2) Health/Exposure Data

What information do we have (1988 Study Findings)?

• The average blood lead level for children 0-7 years potentially exposed to the Prospector Tailings was higher than the comparison area (7.8 ug/dL vs. 4.0 ug/dL) . This difference *was* found to be statistically significant, despite the small comparison sample size.

• Among adults, there was no statistical difference between the target area and comparison area. This suggests children were being exposed differently in the two areas, whereas adults were not.

• 1987 levels in both Prospector and Park Meadows (after capping in Prospector) were lower than those observed in 1984 (before capping in Prospector).

• The average blood lead levels were compared to national averages for white children for the period 1976-1980. This average was reported as approximately 15 ug/dL. All of the averages for Park City were lower than the reported national average. However, national blood lead averages were declining substantially in the 1980s due primarily to the phase out of leaded gas. Because of this, comparing 1987 values with averages from 1976-1980 is not a good comparison (even more so than 1984 data).

• Only one child in Prospector exceeded the CDC guideline at the time of 25 ug/dL (31 ug/dL). This was attributed anecdotally to exposure to lead solder in the home. The average for Prospector was substantially lower than 25 ug/dL. However, the current CDC guideline is 10 ug/dL. Current guidelines call for no greater than a 5% chance that an individual will have a blood lead greater than 10 ug/dL. Former guidelines were based on the *average* of a population as opposed to a 5% chance. More than 5% of the Prospector children exceeded 10 ug/dL.

Upper Silver Creek Watershed Stakeholders Group
Soils Ordinance Work Group
Existing Data Summary

(2) Health/Exposure Data

What information do we have (Public Health Information & Anecdotal)?

- The Utah Department of Health maintains a database called the Utah Blood Lead Registry. Laboratories performing blood lead tests on Utah residents are required to report those tests to the Registry. The Summit County Health Department queried this database. From 1996 to 2000, blood lead tests for 36 children under the age of 7 living in Park City were reported. Of these, only 2 showed a level greater than 10 ug/dL. No other elevated blood leads were reported since 1996 in Park City or anywhere else in Summit County. This suggests that at least since 1996 there is no widespread problem, but only a very small percentage of children living in Park City have been tested.

- The circumstances of the two elevated cases were well known. It is likely that other children have been tested for blood lead but not reported (pre-1996 or other circumstances). It is likely that any other elevated readings would have drawn some public attention.

Park City Municipal Code

Title 11, Chapter 15, Section 1-11

- Minimum coverage with topsoil: 6”
- Standards: 200 ppm New Construction
  1000 ppm Existing Construction
- Mine Tailings: + 1000 ppm Lead
- Hazardous Waste + 1000 ppm Lead
- Dust Control
- Removal
- Disposal
- Enforcement
- Certificate of Compliance

11-5-2. Minimum Coverage with Topsoil

All real property within the Area must be covered and maintained with a minimum cover of six inches (6") of approved topsoil over mine tailings except where such real property is covered by asphalt, concrete or permanent structures or paving materials. Parking shall be restricted to impervious surfaces.

11-15-3 Vegetation

All areas in the Area where real property is covered with six inches (6") or more of approved topsoil must be vegetated with plant material suitable to prevent erosion of topsoil.

11-15-4 Additional Landscaping Requirements

A) Flowers/Vegetables at grade

24" approved topsoil

B) Flowers/Vegetables above grade

16" above approved topsoil cap

C) Shrubs/Trees

6" to 18" approved topsoil around root ball

11-15-11 Failure to Comply with Chapter

The failure to landscape, maintain landscaping, control dust or dispose of tailings as required by this Chapter shall constitute a public nuisance as determined by the City Council of Park City.

What Does the Ordinance Cover?

The City Requires Compliance on the following:

- All new construction in Soils District
- Any activity requiring a building permit in the District
- Properties that test high for lead
- Complaints
- No parking on impervious surfaces
- Disposal
- Dust control

Post SID Efforts

- Capping of areas outside SID (Silver Meadows)
- Ongoing ordinance enforcement by City Building Department
- Law suits to achieve compliance (1992)
- Ordinance boundaries expanded (1994)
- Meetings between City, EPA, and State on administrative controls
- City Council Incentives: Free top soil/Free soils tests
- Public Outreach/Homeowners Associations/Realtors
- City Hires Environmental Specialist (1996)
- Review of City field protocols (1996)
- Environmental Consultants

Construction Containment Efforts

- Builders must come to the City for plan check review
- Prospector Landscaping Ordinance is distributed at this time and made an official part of the plan check review procedure
- Construction activity is monitored by the City's building inspectors
- Typical construction site:

  Excavated material contained on site

  Stockpiled material covered

  Finished site capped and landscaped

  Site tested before certificate of occupancy issued

Certificate of Compliance Program

- At the request of the property owners
- Soil on site is samples
- Site mitigated commensurate with sampling data
- Certificate of compliance issued upon satisfactory mitigation

Soils Ordinance Administrative Data

Since 1995:

- 207 Soils Tests
- 253 Remediation Meetings
- 500+ Individual soil samples sent to lab
- 132 Certificates of Compliance

Where We Are: Statistics

	Acres	Percent
Total Area of Original District	146.5	100
Area in Compliance Today	115.8	79
Vacant Lots (20 lots, capped)	4.6	3.1
TOTAL	120.4	82.1
Developed Lots/ Not Tested (75 lots)	17.5	11.9
Developed Lots/ Tested/ Non-Compliant (37 lots)	8.6	5.8

What We Have Learned

- Dynamic conditions in the field
- Staff intensive implementation/enforcement
- Expensive (SID, Incentives, Personnel, Lab)
- Importance of Real Estate Community
- Remediations increasingly expensive
- Public Education must be constant/on-going

Some Unresolved Issues

- Necessity of a 6" Cap? Is a vegetative cover enough?
- Adequacy of a 6" Cap? Cross contamination opportunities?
- Unmitigated yards
- Are there data gaps?
- Ability to achieve 100% compliance
- How to assure 6" cap remains in place?
- Is re-testing of yards necessary?
- Confusion and uncertainty complicate ordinance implementation